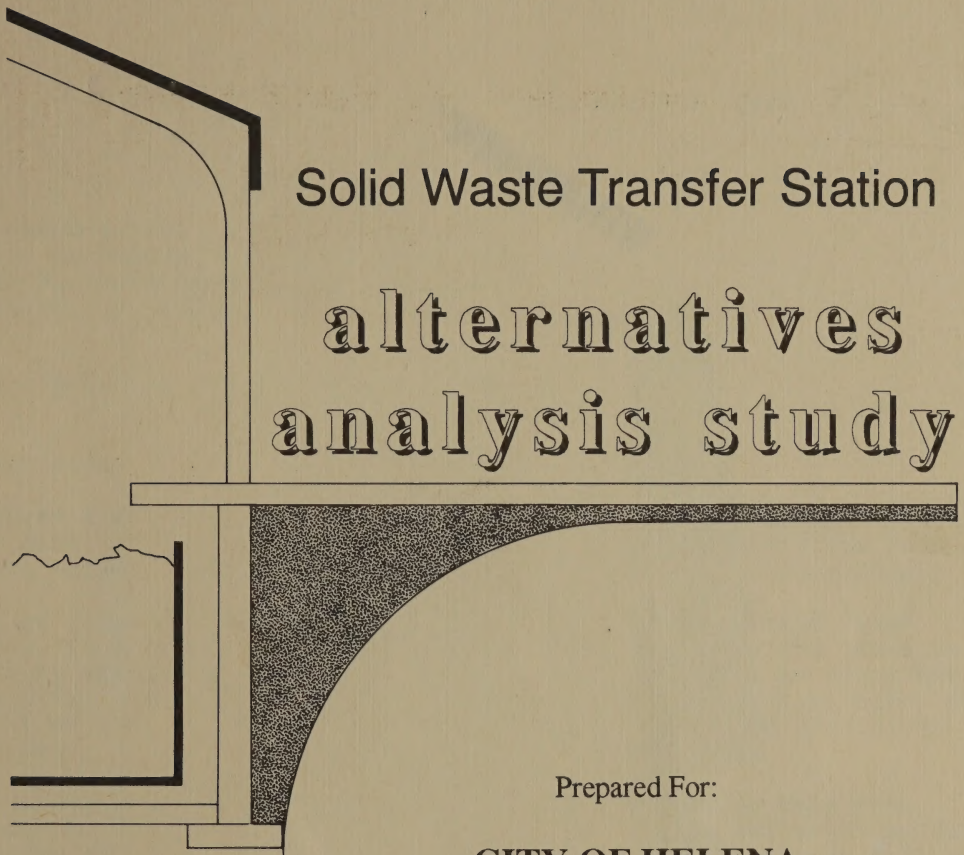

Solid Waste Transfer Station

alternatives analysis study

Prepared For:

CITY OF HELENA
Helena, Montana

MARCH, 1990

M
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D

D A Damschen & Associates
Consulting Engineers
HELENA, MONTANA

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D&A DAMSCHEN & ASSOCIATES, INC.
CONSULTING ENGINEERS
2030 11TH AVENUE • SUITE 11
P.O. BOX 4817 • HELENA, MT 59604
TELEPHONE (406) 449-8627

April 3, 1990

Richard Nisbet
City of Helena
316 No. Park Avenue
Helena, MT 59623

Re: Transfer Station Alternatives Analysis

Dear Dick:

Please find enclosed our Final Report for the referenced project. We have incorporated the Study Committee's recommendations into this report. These recommendations are included in Part Four.

As we discussed at our last committee meeting, the next "key" steps in proceeding with the project is to finalize the location and to determine if the Scratchgravel District will be using the facility. Once final decisions on these items have been made, we will be able to complete the final design, plans and specifications.

We appreciate the opportunity to assist the City on this most important project and look forward to the design and construction phases of the project. If you have any questions, please call me at you earliest convenience.

Very truly yours,

DAMSCHEN & ASSOCIATES, INC.

Barry E. Damschen, P.E.
Project Manager

Enclosure

DAMSCHEN & ASSOCIATES, INC.

Consulting Engineers

April 5, 1990

Richard Brown
City of Helena
316 No. Park Avenue
Helena, MT 59623

Re: Treasure State Alternatives Analysis

Dear Dick,

Please find enclosed our final Report for the referenced project. We have incorporated the Study Committee's recommendations into this report. These recommendations are included in Part Four.

As we discussed at our last committee meeting, the next "key" steps in proceeding with the project is to finalize the location and to determine if the Bureau of Reclamation will be using the facility. Once final decisions on these items have been made, we will be able to complete the final design, plans and specifications.

We appreciate the opportunity to assist the City on this most important project and look forward to the design and construction phases of the project. If you have any questions, please call me at your earliest convenience.

Very truly yours,

DAMSCHEN & ASSOCIATES, INC.

Barry E. Damschen, P.E.
Project Manager

Enclosure

SOLID WASTE
TRANSFER STATION
ALTERNATIVES ANALYSIS
STUDY

Prepared For

CITY OF HELENA, MONTANA

FINAL REPORT

MARCH, 1990

Prepared By:

DAMSCHEN & ASSOCIATES, INC.

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HELENA, MONTANA 59601

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PART ONE

INTRODUCTION

PART ONE

INTRODUCTION

A. GENERAL

In 1986 the City of Helena officials deemed it necessary to begin the search for a new sanitary landfill. This was in light of the fact that the City's existing landfill will reach its capacity in approximately 1991. The Scratchgravel Landfill District Board was also facing the same problem since their site located approximately 4 miles northwest of Helena is also reaching its useful life. In 1986 the two governing bodies created a study committee to jointly locate a new landfill site(s). This study committee retained the firm of Damschen & Associates in February, 1987 to perform the siting study.

During the study period the consultant evaluated several potential landfill sites. In July, 1989 the study committee recommended to the City and County officials that Site E be selected. The local officials subsequently approved the recommendation and in September, 1989 it was decided by both entities that the County would take the lead in purchasing and licensing the new site. The City and County also approved an interlocal agreement whereby the County would dispose of the City's waste for a fair and equable fee. The license application was submitted to the State Solid & Hazardous Waste Bureau on March 16, 1990. The County is hopeful that the landfill site will be licensed and available for use in the fall, 1990.

Due to the fact that the new proposed landfill site is located approximately 10.5 miles northeast of Helena, coupled with the fact that the haul to the site would require traveling on approximately 2½ miles of gravel road, the City officials decided in the Fall of 1989 to implement a transfer system. Under this system, a transfer station would be located in or near the City whereby all City packer trucks and individuals would bring their wastes. The waste would correspondingly be loaded into large semi type vehicles for transport to the new landfill site. The implementation of this type of system would reduce the total number of vehicles traveling to the new landfill site from several hundred per day to less than ten transfer loads per day.

B. SCOPE OF SERVICES

In October of 1989, the City of Helena received proposals from qualified engineering firms to conduct a study to determine which type of transfer system would be the most economical and practical. After reviewing the proposals, the City retained the services of Damschen & Associates, Inc. in December, 1989 to conduct this evaluation. The scope of services for this project includes the following tasks:

1. Obtain and evaluate available information concerning the waste quantities and number and types of vehicles that would use the transfer facility.

2. Obtain available information and determine the feasibility of using the City's existing landfill for the site of the new transfer station. Also discuss with the City officials alternate sites for locating the facility.

3. Review various transfer station concepts and conduct an evaluation for the options deemed most appropriate. Develop preliminary plan schematics and estimate capital and annual costs for each option. Evaluate the options for the wastes generated within the City of Helena only as well as the combined wastes of both the City of Helena and Scratchgravel Landfill District.

4. Prepare a final report which identifies the capital and annual costs of the selected option and review the report with the appropriate City officials.

Included in the following chapters of this report are the findings and recommendations of this study.

PART TWO

SUMMARY OF DESIGN CRITERIA

PART TWO

SUMMARY OF DESIGN CRITERIA

A. GENERAL

In order to evaluate the various types of transfer options that were deemed applicable, it was necessary to initially determine the quantities of wastes and number of vehicles that would use the facility. In order to obtain this information the consultant reviewed the records maintained by the City of Helena's staff at the existing landfill for the past several years. Since the City weighs all vehicles that utilize the existing landfill, excellent records are kept concerning the waste quantities and number of vehicles.

As previously mentioned, the scope of work for this project also included evaluating the additional capital and operating costs if the transfer station were sized large enough to also handle the waste generated within the Scratchgravel Landfill District. In order to conduct this evaluation it was also necessary to obtain waste quantity and traffic data for the existing Scratchgravel Landfill. According to the manager of the Scratchgravel District, the available information concerning these data is quite limited. The only information that is available are from portable traffic counters that were set at the landfill site entrance in September, October and December. No specific waste quantity data has ever been kept according to the current and past landfill operators.

Based on the data obtained from the managers of the two landfills, design criteria was established for the evaluation of the various transfer station options deemed appropriate. The data and corresponding criteria are summarized in the following narrative, tables and figures.

B. WASTE QUANTITIES

1. City of Helena Only

The manager of the City of Helena's landfill provided the consultant with four years of data concerning the waste quantities entering the landfill. The total tonnage of waste by month hauled to the landfill is summarized on Table 1 and graphically depicted on Figure 1. As indicated on the table, the total waste hauled to the site averaged approximately 28,000 tons per year over the last four year period. The peak waste volumes typically were generated in the months of May and June with approximately 3,000 tons per month disposed of at the site during these two months. For this study it was assumed that the average peak daily waste quantity that would be handled would be approximately 115 tons per day (3,000 tons per month ÷ 26 days per month). Also for this study it was assumed that the annual waste quantities generated within the City of Helena would be 30,000 tons

TABLE 1

CITY OF HELENA LANDFILL
TOTAL TONNAGE BY MONTH

	1986	1987	1988	1989	Avg.	% of Total
January	1,920	1,815	1,672	1,804	1,803	6.5
February	1,643	1,863	1,934	1,092	1,633	5.8
March	2,442	1,880	2,382	1,845	2,137	7.7
April	2,514	2,662	2,758	2,645	2,645	9.5
May	2,744	2,965	2,330	3,730	2,942	10.5
June	2,811	2,846	2,974	2,511	2,786	10.0
July	2,352	2,946	2,009	2,472	2,460	8.8
August	2,686	2,621	2,375	2,479	2,540	9.1
September	2,589	2,688	2,023	3,618	2,730	9.8
October	2,504	2,303	2,001	2,189	2,249	8.1
November	1,980	2,106	1,590	2,294	1,992	7.1
December	2,018	2,181	2,144	1,649	1,998	7.1
Totals	28,203	28,876	26,252	28,328	27,915	100.0

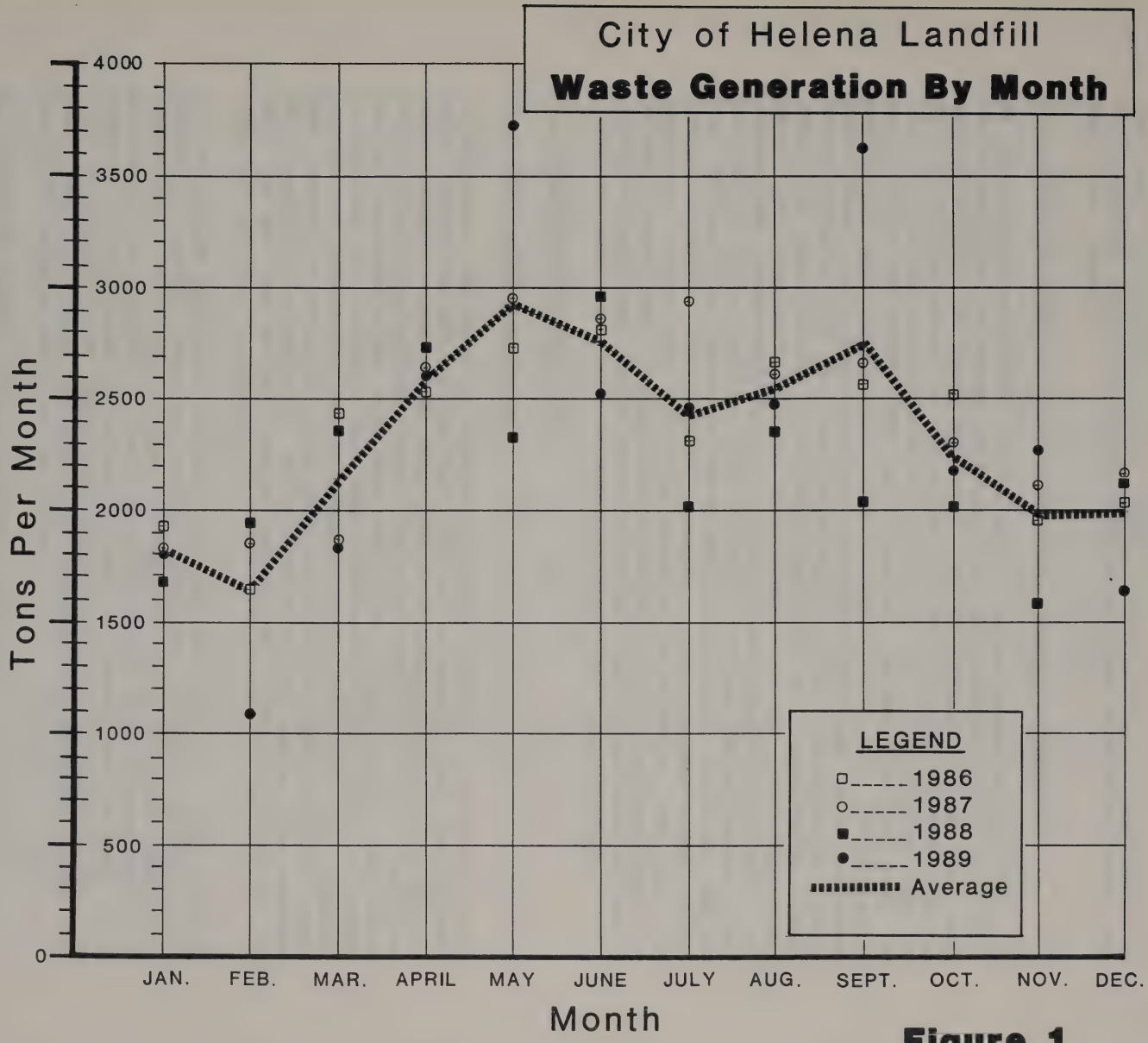

City of Helena Landfill
Waste Generation By Month
Tons Per Month
4000
3500
3000
2500
2000
1500
1000
500
0
JAN.
FEB.
MAR.
APRIL
MAY
JUNE
JULY
AUG.
SEPT.
OCT.
NOV.
DEC.
Month
LEGEND
1986
1987
1988
1989
Average

Figure 1

per year. This would allow a contingency factor of approximately 7% compared to the average waste quantities generated over the past four years.

2. City of Helena and Scratchgravel Landfill District

As previously mentioned, there are no known records that indicate the quantities of waste delivered to the Scratchgravel landfill. According to the local officials, it is estimated that the contributing population to the site is approximately 12,000 people. If an average waste generation rate of 4.5 lbs/capita/day is used, it is estimated that approximately 10,000 tons per year of waste are generated within the District. From the consultant's experience in other areas of the state coupled with numerous conversations with the Scratchgravel landfill operators and managers, it appears that this waste quantity is a reasonable estimate and thus was used for this study. If the seasonal waste generation characteristics in the Scratchgravel District are similar to those for the City of Helena it can be estimated that the average peak month's waste generation would be 10.5% of the annual total. This would result in an average peak daily quantity of 35 tons. If this quantity is added to the City of Helena's estimated average peak quantity of 115 tons per day, the total average peak waste quantity if both entities were to use a transfer facility would be approximately 150 tons per day.

C. EXISTING TRAFFIC DATA

1. City of Helena Only

To evaluate the various transfer station options, the most important factor in sizing the facility is to handle the anticipated peak traffic volumes. At the City of Helena landfill, the majority of the vehicles that enter the site are "free haul" vehicles which represents the citizens that live in the City. The other categories of haulers that use the site are the City's packer trucks and commercial establishments that haul their own wastes. The number of vehicles that used the site in the previous years is summarized on Table 2. As indicated on the table, the average vehicles per day varied from a high of 168 in May to a low of 67 vehicles per day in January.

To determine the peak vehicles per day that utilize the City's landfill, traffic records for the previous six month period were reviewed. (The total number of vehicles that utilized the site the first six months of the year had already been discarded.) A summary of the peak vehicles per day for each week during this six month period are summarized on Table 3. As indicated on the table the peak daily vehicle count occurred on Saturday June 17, when 237 vehicles entered the site.

2. City of Helena and Scratchgravel District

As previously indicated, limited information is available concerning the number of vehicles that utilize the Scratchgravel

TABLE 2

CITY OF HELENA LANDFILL
VEHICLE DATA

FREE HAUL VEHICLES

	1988	1989	Average	%
January	1,341	996	1,169	4.4
February	1,382	679	1,031	3.9
March	2,148	1,155	1,651	6.2
April	3,442	3,078	3,260	12.2
May	2,841	3,269	3,055	11.4
June	3,270	3,472	3,371	12.6
July	2,646	3,221	2,934	11.1
August	2,593	2,827	2,710	10.3
September	2,075	2,550	2,313	8.7
October	2,248	2,414	2,331	8.8
November	1,349	1,654	1,502	5.6
December	1,232	1,313	1,273	4.8
Totals	26,567	26,628	26,600	100.0

TOTAL VEHICLES

FOR SELECTED MONTHS (1989)

	CITY		OTHER			AVERAGE VEHICLES PER
	No.	%	No.	%	TOTAL	DAY
January	400	24	1,274	76	1,674	67
May	570	13	3,803	87	4,373	168
August	540	14	3,345	86	3,885	144
October	470	15	2,763	85	3,233	129

TABLE 3

CITY OF HELENA LANDFILL
PEAK DAILY VEHICLE COUNTS

	PEAK WEEKDAY	SATURDAY
June 5-10	188	236
12-17	194	237
19-24	182	220
26- 1	195	209
July 3- 8	192	185
10-15	192	157
17-22	176	189
24-29	214	187
31- 5	196	193
Aug. 7-12	155	183
14-19	162	169
21-26	163	154
28- 2	136	200
Sept. 4- 9	174	157
11-16	138	173
18-23	175	166
25-30	165	175
Oct. 2- 7	116	153
9-14	196	186
16-21	165	197
23-28	129	98
30- 4	108	112
Nov. 6-11	139	161
13-18	99	125
20-25	110	84
27- 2	84	100
Dec. 4- 9	92	83
11-16	71	62
18-23	68	84

landfill. The County planning office set portable traffic counters at the site's entrance on selected days in September, November and December of 1989. The total number of vehicles that used the site during these days are depicted on Table 4. As indicated on the table the number of vehicles per day varied from 61 on Thursday, December 7 to 301 on Saturday, September 23. For comparison purposes the consultant also listed the number of vehicles that used the City of Helena's site on the same days. As indicated in the table, the average number of vehicles that utilized the Scratchgravel landfill was 262% higher than the number of vehicles that used the City's landfill. This is interesting to note since on a typical day the tonnage of waste brought to the City's landfill is three times higher than the Scratchgravel landfill. The primary reason for this is due to the fact approximately 50% of the waste brought to the City's landfill is in packer trucks where as less than 20% of the waste hauled to the Scratchgravel landfill is in packers.

D. DESIGN TRAFFIC VOLUMES

1. City of Helena Only

To develop a design traffic volume for the transfer station options in which only the City of Helena's waste would be handled, the consultant assumed that the peak number of vehicles that used the site during the June 1-December 31, 1989 period would be appropriate (237 vehicles on Saturday, June 17). To handle this volume of traffic it was then necessary to estimate the peak vehicles that would enter the site during a given peak hour. From the consultant's experience on other projects it was found that typically the peak vehicles per hour can be estimated by assuming that the total vehicles arriving at the facility would enter the site in two-thirds of the total time that the site is open during the day. Assuming that the City's landfill is open from 8:00 a.m. to 5:00 p.m. (9 hours total), the peak hourly traffic number for design purposes was calculated as follows:

237 vehicles/day ÷ (2/3 x 9 hours) = 39.5 vehicles/hour

Once the hourly design traffic number has been calculated, it was necessary to calculate the total number of dumping stalls that would be needed. Based on a survey conducted by the consultant, it was estimated that the average hauler takes approximately 6 minutes to enter the active landfill area, dump his trash and leave the landfill area. To be conservative, if it is assumed that the average hauler will take 8 minutes to dump their load (including maneuvering time), the number of stalls to handle the City's waste equals 5.2 stalls.

(39.5 veh/hr ÷ 7.5 veh/hr/stall = 5.2 stalls required)

For the options evaluated in this study the consultant used a minimum of six dumping stalls to provide a conservative approach and to take into account future growth in the City of Helena.

TABLE 4

COMPARISON OF VEHICLES

CITY OF HELENA VS. SCRATCHGRAVEL

DATE (1989)	DAY	SCRATCHGRAVEL	CITY OF HELENA
Sept. 23	Sat	301	150
Nov. 28	Tue	290	60
Nov. 29	Wed	178	70
Nov. 30	Thurs	171	40
Dec. 1	Fri	166	55
Dec. 2	Sat	361	90
Dec. 4	Mon	193	80
Dec. 5	Tue	139	63
Dec. 6	Wed	121	69
Dec. 7	Thurs	61	55
Dec. 8	Fri	98	62
Total		2,079	794
Average		189	72

Ratio Scratchgravel versus City of Helena = 2.62:1 (189 + 72)

2. City of Helena and Scratchgravel District

As indicated in Section C of this Chapter, available traffic information indicates that the number of vehicles using the Scratchgravel landfill on the average is 262% higher than the number of vehicles that use the City of Helena's site. Based on this data it can be assumed that on June 17, 1989, 621 vehicles would have used the Scratchgravel landfill (237 vehicles that used the City's landfill on that day x 2.62 = 621 vehicles). According to the operators of the Scratchgravel landfill, they estimate that it would not be uncommon for this number of vehicles to enter the landfill on a spring or summer day. Based on this input the consultant assumed for this study that the design traffic number for the vehicles from the Scratchgravel District would be 621 vehicles/day.

Like for the City of Helena's site, the consultant also conducted a study to determine the average time it takes haulers at the Scratchgravel landfill to dump their trash. Based on this study, it was determined that the Scratchgravel users on the average dump their trash (including maneuvering time) in 3.7 minutes or approximately twice as fast as the users of the City of Helena's site. This fact is understandable since most users of the Scratchgravel landfill do not subscribe to a door to door collection service. Thus, these residents will typically make more trips to the landfill than the City of Helena residents who have mandatory door to door collection service and also will have less waste each time the users frequent the site. The City of Helena users on the contrary typically will make a trip to the landfill when they have accumulated a significant amount of waste, therefore taking longer to dump their wastes than the typical Scratchgravel landfill user.

To calculate the number of stalls that would be needed to handle the Scratchgravel landfill users at a transfer station, it was assumed that each user on the average would dump their trash in 5 minutes. Also it was assumed that the peak hourly traffic would be calculated in the same manor as that described for the City of Helena. Based on these assumptions, the total number of stalls needed to handle the Scratchgravel District members would be 8.6.

$$621 \text{ veh/day} \div (2/3 \times 9 \text{ hrs}) \div 12 \text{ veh/stall/hr} = 8.6 \text{ stalls}$$

Based on the data and the assumptions stated herein, it was assumed that for the options in which both the City of Helena and Scratchgravel members would use a new transfer station a minimum of 14 stalls (8.6 + 5.2 = 13.8) would be needed to adequately handle the traffic.

PART THREE

EVALUATION OF OPTIONS

PART THREE

EVALUATION OF OPTIONS

A. SCREENING OF ALTERNATE CONCEPTS

Initially during the alternatives evaluation phase of the project, the consultant meet with the committee that had been assembled by the City of Helena for this project. During this meeting, the consultant discussed several transfers concepts. These concepts included a roll-off container system, loose haul open top trailer systems, compacted transfer system with either stationary compactors or trailer mounted compactors, a push pit system with a stationary compactor and baling systems.

After significant discussions on the various systems, it was the general consensus of the consultant and the committee that two basic concepts should be evaluated in detail. These included:

1) a loose haul system using open top trailers and
2) a baling facility.

For each type of facility it was also agreed by the committee that layouts and costs should be evaluated for handling the wastes generated in the City of Helena only as well as the option of jointly handling the Scratchgravel Landfill District's waste and the City's waste at a larger facility. The results of this analysis are included herein.

B. DESCRIPTION OF SELECTED OPTIONS

During this phase of the analysis the consultant initially developed schematic building and site layouts for each of the options. The layouts were conceptual in nature and were not developed with a specific site in mind. Summarized in the following narrative is a brief description of each option that was evaluated. Schematic layouts for each option are depicted on Figures 2 through 6.

Loose Haul - City of Helena Only

Option IA — This facility would have a 145' x 60' metal building with walls on three sides and open on the tipping area entrance side. There would be room for 7 dumping stalls for individual dumping and two trailer areas which could be loaded simultaneously. All dumping would be done from one side. For all loose haul options it was assumed that one mechanical arm would be mounted behind each transfer trailer loading hopper to consolidate the loads in the trailers and to pick out any undesirable materials. Each loose haul option would also utilize specially designed "live bottom" floors whereby the transferred loads of wastes would be unloaded at the landfill within

approximately five minutes. Each of the loose haul options discussed herein also would utilize a front end loader on the tipping floor to push the waste dumped onto the floor by the haulers into the hopper(s) that would be located over the transfer trailers. (See Figure 2)

Option IB — This facility would be similar to Option IA except that the building would be larger (145' x 100') to accommodate dumping inside with a minimum of one day of waste floor storage.

Option II — This facility would have a 100' x 70' metal building with walls on two sides. There would be one trailer loading area with dumping on both sides. These two sides would not be enclosed. There would be sufficient room for 7 vehicles dumping simultaneously. This facility could be expanded to incorporate the Scratchgravel members (See Figure 3)

Loose Haul - City of Helena and Scratchgravel

Option III — This facility would be an expansion of Option II with an enclosed 140' x 100' building. There would be two trailer loading areas and a total of 14 dumping stalls. Dumping would be from both sides of each trailer. This option also would include a second scale (one scale for incoming and one scale for outgoing traffic due to the high volumes).

Option IV — This facility would have a 210' x 120' enclosed building with a total of 19 dumping stalls. There would be three trailer loading areas with dumping on both sides. There again would be two scales. (See Figure 4)

Baling - City of Helena Only

This facility would have a 110' x 190' enclosed building with 7 dumping stalls. The waste would be dumped onto the floor by the haulers and pushed onto a conveyer using a front loader. The waste would be baled using a 25 ton per hour tie baler. The bales would be loaded by a forklift onto a flatbed that would be located inside the building. (See Figure 5) The baler would not be able to accept large bulky items including white goods, construction demolition debris, etc. and thus this waste would have to be handled at another facility. This is unlike the loose haul system that could handle these bulky materials.

Baling - City of Helena and Scratchgravel

This facility would be similar to the previous option with the exception that the building would be larger to accommodate 12

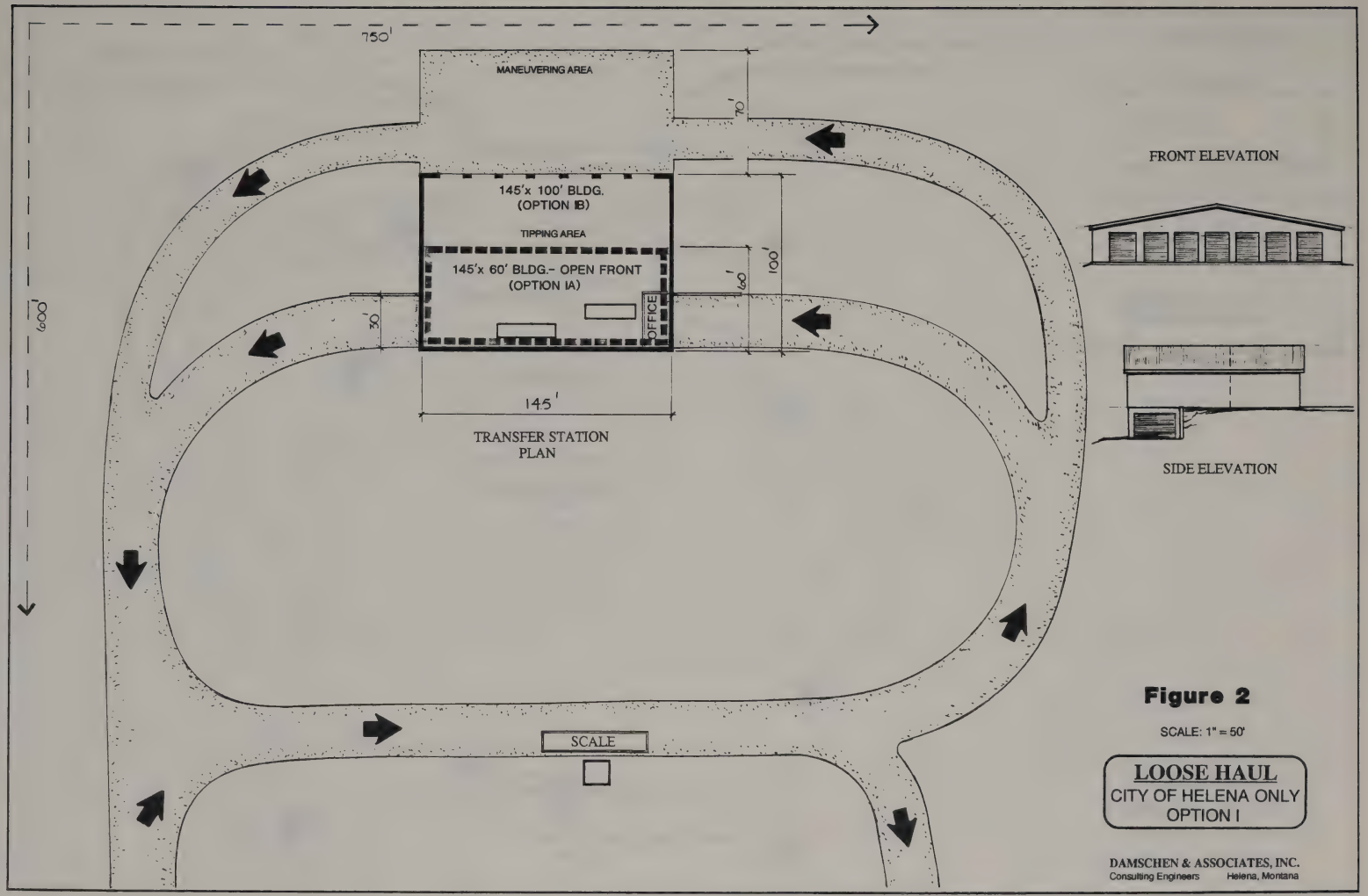


Figure 2

SCALE: 1" = 50'

LOOSE HAUL
CITY OF HELENA ONLY
OPTION I

DAMSCHEN & ASSOCIATES, INC.
Consulting Engineers Helena, Montana

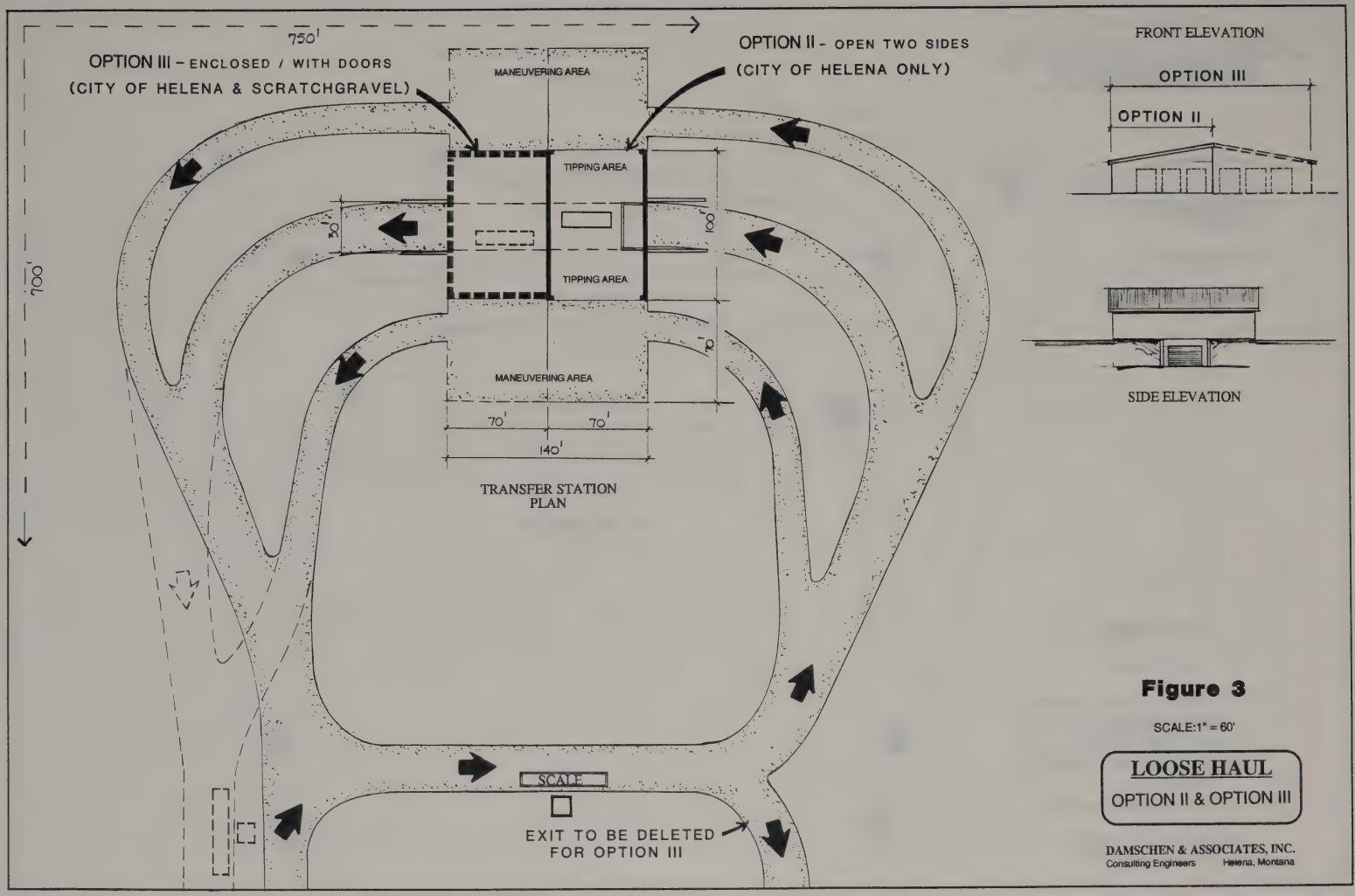


Figure 3

SCALE:1" = 60'

LOOSE HAUL

OPTION II & OPTION III

DAMSCHEN & ASSOCIATES, INC.
Consulting Engineers Helena, Montana

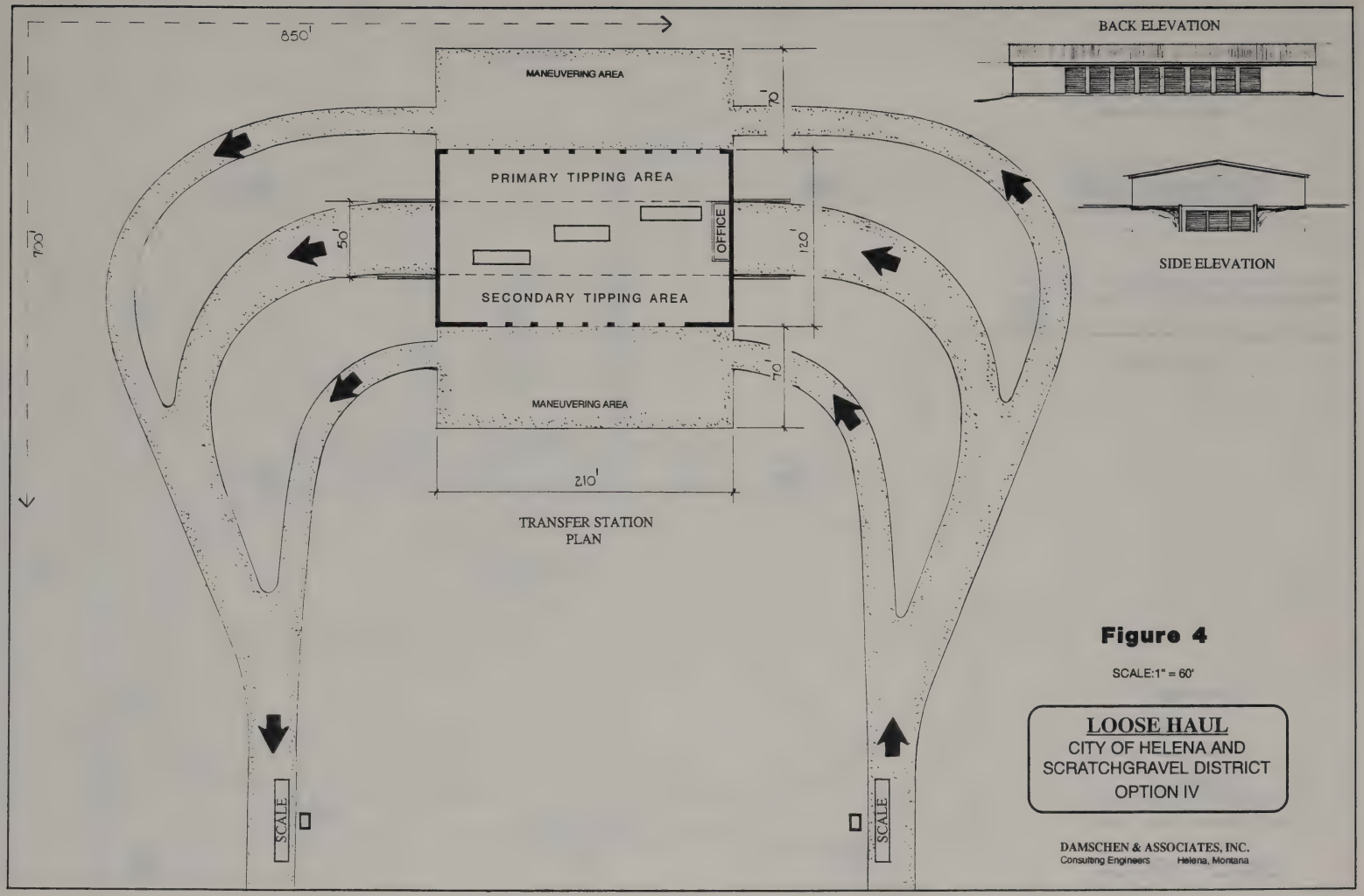
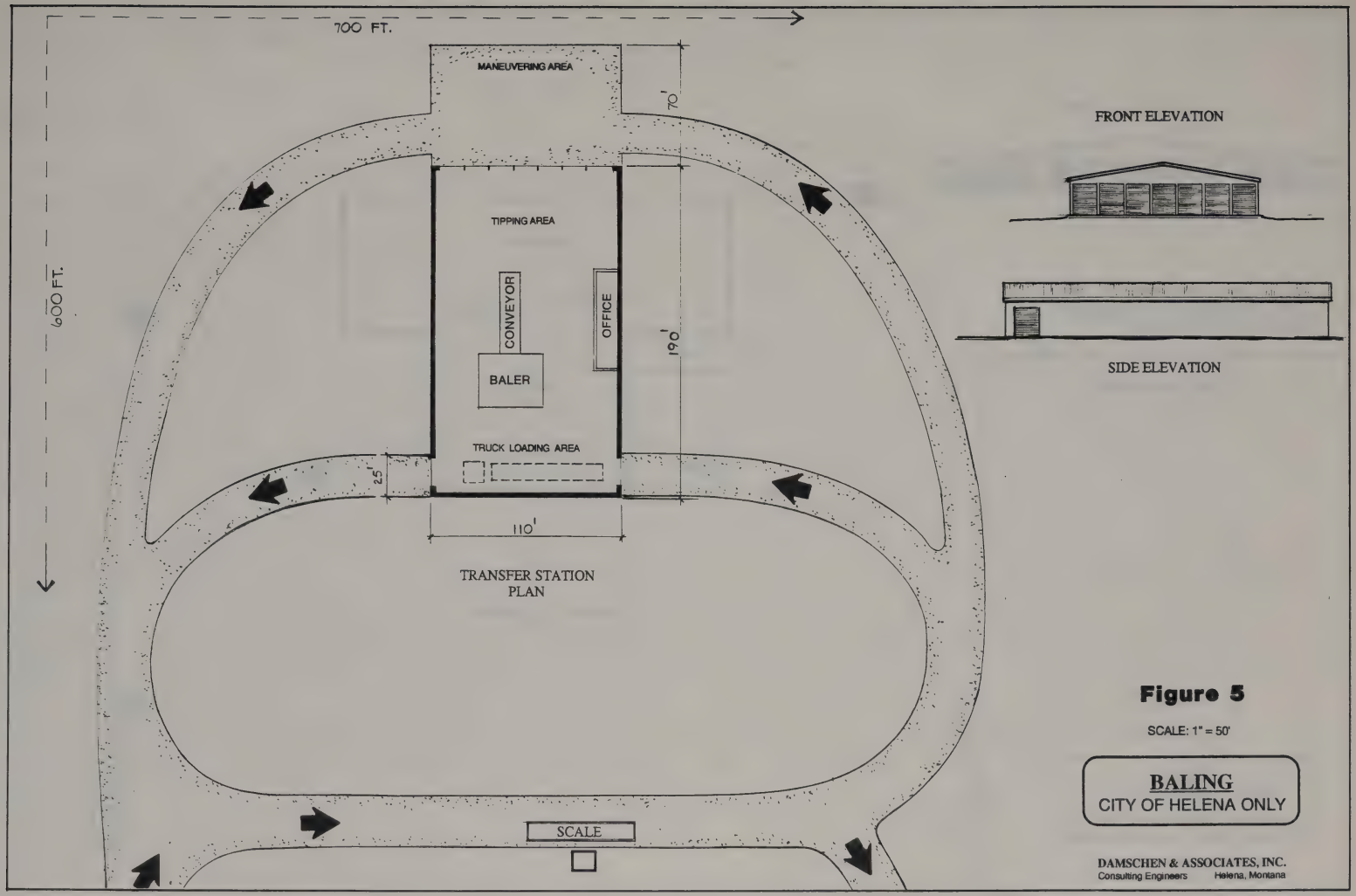


Figure 4

SCALE:1" = 60'

LOOSE HAUL
CITY OF HELENA AND
SCRATCHGRAVEL DISTRICT
OPTION IV

DAMSCHEN & ASSOCIATES, INC.
Consulting Engineers Helena, Montana



TRANSFER STATION
PLAN

FRONT ELEVATION

SIDE ELEVATION

Figure 5

SCALE: 1" = 50'

BALING
CITY OF HELENA ONLY

DAMSCHEN & ASSOCIATES, INC.
Consulting Engineers Helena, Montana

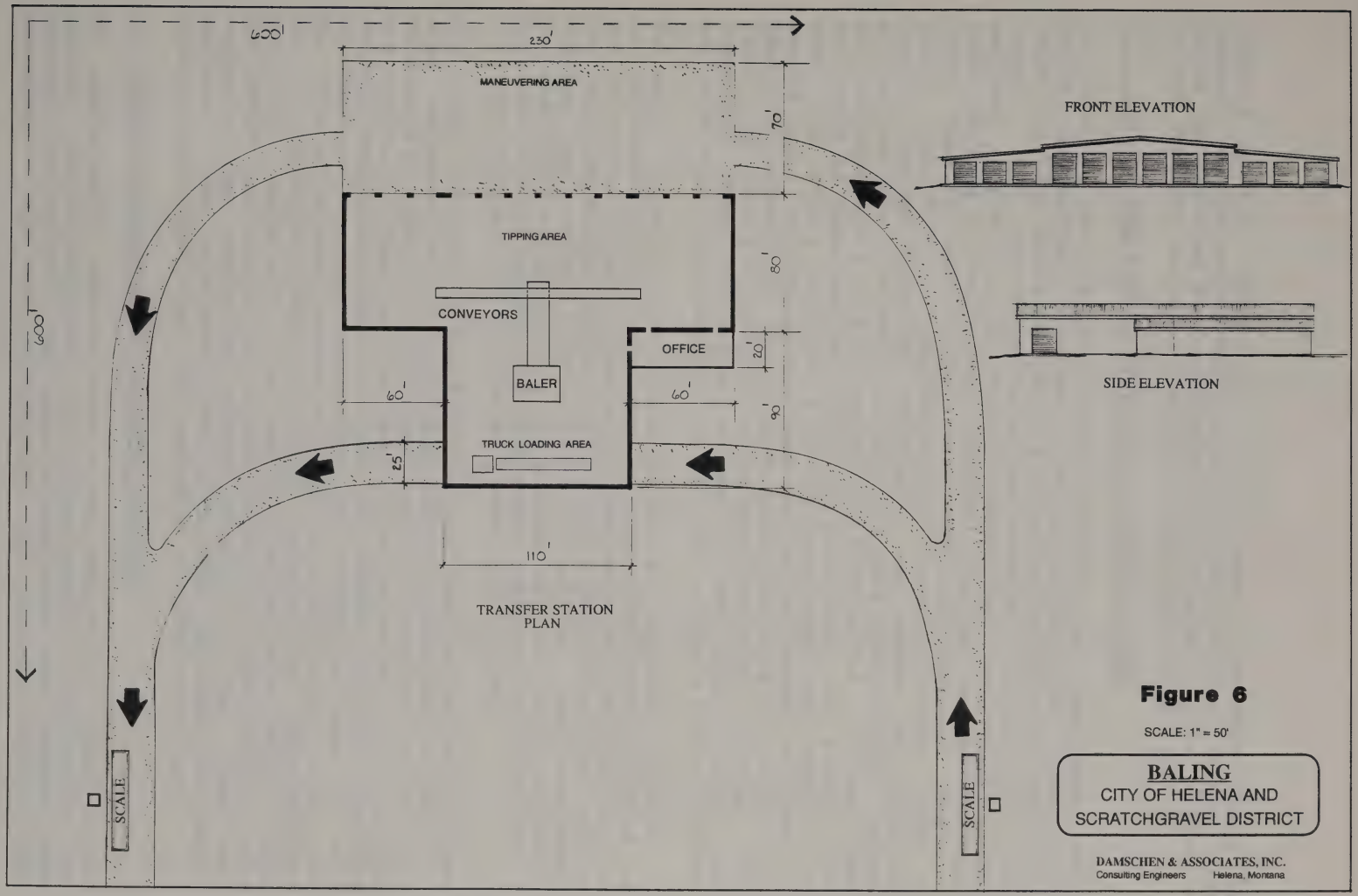


Figure 6

SCALE: 1" = 50'

BALING
CITY OF HELENA AND
SCRATCHGRAVEL DISTRICT

DAMSCHEN & ASSOCIATES, INC.
Consulting Engineers Helena, Montana

dumping stalls compared to 7. Additional conveyers would be needed but the actual baler would be the same size. There also would be the need for two scales. (See Figure 6) The operation of the facility would be similar to the previous option.

C. CAPITAL AND ANNUAL COSTS OF SELECTED OPTIONS

To evaluate each of the selected options, the consultant estimated the capital and annual operating costs. The costs estimates were not based on specific sites but rather were general in nature. The capital costs of the loose haul options are summarized in Table 5. It should be noted that the facility costs were included in the 20 year component, whereby the rolling stock costs were included in the 5 year component category. Since a grade separation of approximately 15 vertical feet would be needed for the loose haul options, it was assumed for this analysis that the site would be flat and that a substantial volume of fill would have to be brought in and compacted. If the final site were to have some natural grade separation, the capital cost would be most likely less than the costs depicted herein. It should also be pointed out that the capital costs depicted in Table 5 include only the extra transfer trailers but do not include the one tractor and trailer that would be needed. The costs of these units are included in the total system cost analysis which is summarized in the next section of this Chapter.

The capital costs of the baling options are included in Table 6. As indicated in the table, the facility costs were included in the 20 year components, the baling equipment was included in the 10 year components and the rolling stock (excluding the initial tractor and trailer) were included in the five year component. It should be noted that a grade separation would not be needed for the baling options and thus there would be no need for a significant amount of fill to be placed at the site.

The annual operating costs for the loose haul and baling options were estimated by the consultant and are summarized on Table 7. It should be noted that the labor rates utilized for the analysis are typical of those paid by the City of Helena with similar job related responsibilities. It also was assumed that the transfer station would be open 9 hours per day, 6 days per week if only the City of Helena's wastes were to be handled and 9 hours per day, 7 days per week if City of Helena and Scratchgravel District's waste were to be handled. As indicated in the table the annual operating costs of the facility are substantially more expensive for the baling options compared to the loose haul options. This is primarily due to the high operation and maintenance costs associated with operating a solid waste baler.

D. TOTAL SYSTEM COST OF SELECTED OPTIONS

To equivalently compare each of the options, a total annual system cost was estimated. The system costs of each option are depicted on Table 8. The annual system costs were broken down according to four cost components for the loose haul options and

TABLE 5

LOOSE HAUL OPTIONS

CAPITAL COSTS

ITEM	OPTION IA 2 TRAILERS ONE SIDE HELENA ONLY	OPTION IB 2 TRAILERS ONE SIDE HELENA ONLY	OPTION II 1 TRAILER BOTH SIDES HELENA ONLY	OPTION III 2 TRAILERS BOTH SIDES HELENA & S.G	OPTION IV 3 TRAILERS BOTH SIDES HELENA & S.G.
20 YEAR COMPONENTS					
1. Land	$20,000	$20,000	$24,000	$24,000	$28,000
2. Site Work	10,000	10,000	15,000	15,000	15,000
3. Road Fill	34,000	34,000	67,000	58,000	82,000
4. Building Fill	43,000	43,000	33,000	53,000	71,000
5. Gravel	12,000	11,000	14,000	18,000	15,000
6. Paving	22,000	18,000	16,000	28,000	24,000
7. Concrete	213,000	282,000	203,000	385,000	545,000
8. Building	113,000	188,000	91,000	182,000	328,000
9. Mech. Arm	120,000	120,000	60,000	120,000	180,000
10. 14' Doors	0	21,000	0	36,000	75,000
11. 24' Doors	8,000	8,000	8,000	8,000	0
12. Office	9,000	9,000	9,000	9,000	12,000
13. Scale & House	60,000	60,000	60,000	120,000	120,000
14. Hoppers	30,000	30,000	15,000	30,000	45,000
15. Fencing, etc.	15,000	15,000	15,000	20,000	20,000
16. Conting. & Eng.	142,000	174,000	126,000	221,000	312,000
17. Const. Int.	17,000	21,000	15,000	27,000	37,000
Subtotal	$868,000	$1,064,000	$771,000	$1,354,000	$1,909,000
5 YEAR COMPONENTS					
1. Bobcat	$ 30,000	$ 30,000	$ 30,000	$ 60,000	$ 60,000
2. Extra Trailers	90,000	90,000	45,000	90,000	135,000
3. Contingency	12,000	12,000	8,000	15,000	20,000
Subtotal	$132,000	$ 132,000	$ 83,000	$ 165,000	$ 215,000
TOTAL	$1,000,000	$1,196,000	$854,000	$1,519,000	$2,124,000

TABLE 6

BALING OPTIONS

CAPITAL COSTS

ITEM	HELENA ONLY	HELENA & SCRATCHGRAVEL
20 YEAR COMPONENTS		
1. Land	$ 20,000	$ 20,000
2. Site Work	10,000	10,000
3. Gravel	9,000	8,000
4. Paving	2,000	10,000
5. Concrete	259,000	342,000
6. Building	272,000	378,000
7. 14' Doors	27,000	51,000
8. Office	9,000	18,000
9. Scales, etc.	60,000	120,000
10. Fencing, Lighting, etc.	15,000	20,000
11. Conting. & Engineering	137,000	195,000
12. Interest During Const.	17,000	23,000
Subtotal	$837,000	$1,195,000
10 YEAR COMPONENTS		
1. Baler	$275,000	$275,000
2. Conveyers	75,000	150,000
3. Installation	35,000	43,000
4. Spare Parts	35,000	43,000
5. Contingency	42,000	51,000
Subtotal	$462,000	$562,000
5 YEAR COMPONENTS		
1. Bobcat	$ 30,000	$ 60,000
2. Fork Lift	60,000	60,000
3. Extra Trailer	20,000	20,000
4. Contingency	11,000	14,000
Subtotal	$121,000	$154,000
TOTAL	$1,420,000	$1,911,000

TABLE 7

TRANSFER STATION

OPERATING COSTS

ITEM	OPTIONS			
	LOOSE HAUL		BALING	
Labor	HELENA (6 Days)	HELENA & S.C. (7 Days)	HELENA (6 Days)	HELENA & S.C. (7 Days)
1/2 Supervisor	$14,000	$14,000	$14,000	$14,000
Operators	29,000	34,000	58,000	67,000
Laborers	8,000	25,000	8,000	25,000
Scale Attendant	17,000	39,000	17,000	39,000
Subtotal	$68,000	$112,000	$97,000	$145,000
Utilities & Insurance				
Sewer For Baler	-	-	$ 3,000	$ 4,000
Other	$ 5,000	7,000	7,000	8,000
Insurance	5,000	10,000	12,000	14,000
Subtotal	$10,000	$17,000	$22,000	$26,000
Site Maintenance				
Building, Misc.	$2,000	$3,000	$3,000	$4,000
Roads	5,000	5,000	4,000	4,000
Subtotal	$7,000	$8,000	$7,000	$8,000
Equipment				
Mech. Arm	$6,000	$8,000	-	-
Baler & Conveyers	-	-	$45,000	$60,000
Bobcat	3,000	4,000	4,000	5,000
Fork Lift	-	-	4,000	5,000
Subtotal	$9,000	$12,000	$53,000	$70,000
TOTAL FACILITY ANNUAL COSTS	$94,000	$149,000	$179,000	$249,000

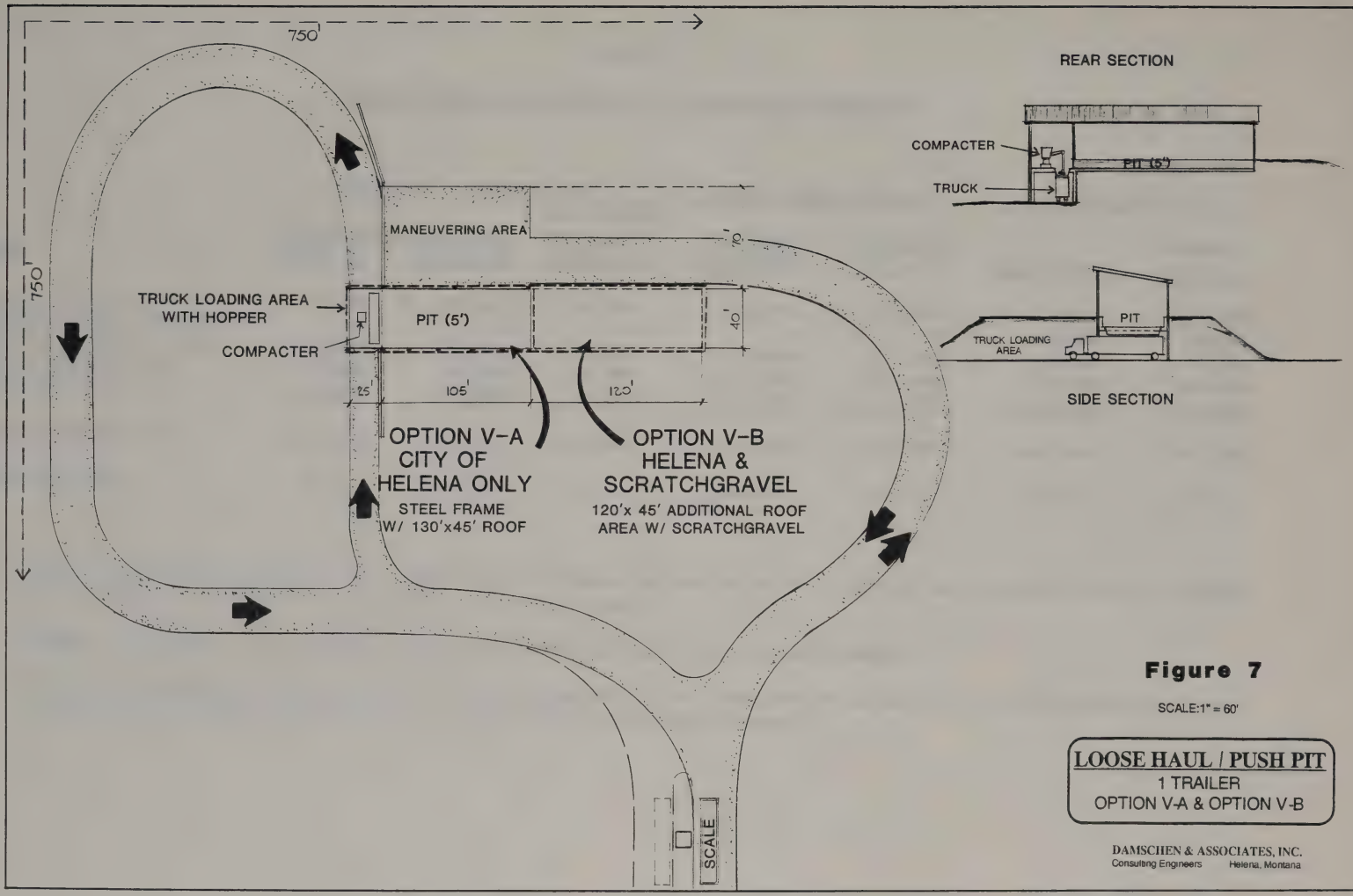


Figure 7

SCALE:1" = 60'

LOOSE HAUL / PUSH PIT
1 TRAILER
OPTION V-A & OPTION V-B

DAMSCHEN & ASSOCIATES, INC.
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TABLE 8

ANNUAL SYSTEM COST SUMMARY OF TRANSFER ALTERNATIVES

ITEM	LOOSE HAUL - HELENA ONLY			LOOSE HAUL WITH S.G.		BALING ***	
	TWO TRAILERS-ONE SIDE OPTION IA	TWO TRAILERS-ONE SIDE OPTION IB	ONE TRAILER TWO SIDES OPTION II	2 TRAILERS OPTION III	3 TRAILERS OPTION IV	HELENA ONLY	HELENA & S.G.
Amort. of Cap. 20 yrs	$ 88,000	$ 108,000	$ 78,000	$ 138,000	$ 194,000	$ 85,000	$ 121,000
Amort. of Cap. 10 yrs	0	0	0	0	0	69,000	84,000
Amort. of Cap. 5 yrs	33,000	33,000	21,000	41,000	54,000	30,000	39,000
Tran. Station O&M	94,000	94,000	94,000	149,000	149,000	179,000	249,000
Transfer to LF *	54,000	54,000	54,000	72,000	72,000	42,000	56,000
TOTAL ANNUAL COST	$ 269,000	$ 289,000	$247,000	$ 400,000	$ 469,000	$ 405,000	$ 549,000
COST PER TON **	$8.96	$9.63	$8.23	$10.00	$11.73	$13.50	$13.73

* Based on 20 mile round trip to landfill and includes depreciation of 1 tractor and 1 trailer unit ($.18/ton-mile for loose haul and $.14/ton-mile for baled waste)

** Based on 30,000 tons for Helena waste and 10,000 tons for Scratchgravel waste.

*** Does not include cost of handling loose bulky materials that can not be baled. (It is estimated that this waste will represent approximately 15-20% of the total waste stream.

five cost components for the baling options. The three amortization of capital components were based on an 8 percent interest amortized over either 20 years, 10 years or 5 years. The amortized costs were based on the capital costs included in Tables 5 and 6. The operation and maintenance costs were based on the annual costs depicted on Table 7. The transfer to landfill cost component included the amortization of a tractor and transfer trailer, labor and operation and maintenance costs to haul the wastes from the transfer station to the proposed new landfill site. It was assumed that the distance to the landfill would be 10 miles in each direction.

As indicated in Table 8, the cost per ton for the loose haul options are significantly less than the costs for the baling options. It is also interesting to note that the costs per ton are higher for the options that would include the Scratchgravel District when compared to the options that would handle only the City of Helena's wastes. This additional cost is due primarily to the fact that the facility would have to be double in size and operate one more day per week to handle the substantial increase in traffic that would be generated from the Scratchgravel District's members. This additional cost, however, would only be offset by adding one-third more residential units. It should also be pointed out that the baling options did not include the additional costs that would be incurred to handle the large bulky materials that can not be baled where the loose haul option has the capabilities to also handle these types of waste.

E. PUSH PIT - LOOSE HAUL OPTION

Upon completion of the analysis of the options discussed herein, the consultant presented the preliminary analysis to the study committee. During the review process a new loose haul option was derived and correspondingly evaluated by the consultant. A schematic plan of this option is depicted on Figure 7. This option would utilize a concrete pit 5 feet deep and 40 feet wide in which the wastes would be dumped into by the individual haulers and packer trucks. This is in contrast to the wastes being dumped onto a tipping floor as discussed in the previous loose haul options. The pit would have a roof over it to prelude precipitation from falling onto the wastes. The waste deposited into the pit would be pushed to one end by a dozer and loaded into open top transfer trailers. A mechanical arm would again be used to consolidate the loads and pick out undesirable materials.

The capital and annual costs for this option are depicted on Tables 9 and 10 respectively. Costs were estimated for handling only the City of Helena's waste as well as the Scratchgravel District's waste. The total annual system costs for these two suboptions was estimated. These costs are summarized on Table 11. It should be noted that the total cost per ton for the push pit options are similar to the loose haul options previously evaluated. The capital costs, however, are less for the push pit option compared to the floor dump concept but the annual operating costs are higher due primarily to the cost to operate the

TABLE 9

PUSH PIT - LOOSE HAUL

OPTION V

CAPITAL COSTS

ITEM	OPTION V-A CITY OF HELENA	OPTION V-B HELENA & S.G.
20 Yr. Components		
1. Land	22,000	26,000
2. Site Work	15,000	15,000
3. Road Fill	40,000	58,000
4. Building Fill	28,000	48,000
5. Gravel	11,000	14,000
6. Paving	9,000	20,000
7. Concrete	152,000	195,000
8. Building	59,000	113,000
9. Mech. Arm	60,000	60,000
10. Office	10,000	12,000
11. Scale & House	60,000	120,000
12. Hopper	25,000	25,000
13. Litter Fence	1,000	2,000
14. Fencing	15,000	15,000
15. Conting. & Engineering	101,000	144,000
16. Const. Interest	12,000	16,000
Subtotal	$620,000	$883,000
5 Yr. Components		
1. Dozer	$100,000	$100,000
2. Extra Trailer	45,000	45,000
3. Contingencies	15,000	15,000
Subtotal	$160,000	$160,000
TOTAL	$780,000	$1,043,000

TABLE 10

PUSH PIT - LOOSE HALUL

OPTION V

OPERATING COSTS

ITEM	OPTION V-A HELENA ONLY	OPTION V-B HELENA & S.G.
Labor		
1/2 Supervisor	$ 14,000	$ 14,000
Operators	29,000	34,000
Laborers	8,000	25,000
Scale Attendant	17,000	39,000
Subtotal	$ 68,000	$112,000
Utilities & Insurance		
Other	$ 5,000	$ 7,000
Insurance	5,000	10,000
Subtotal	$ 10,000	$ 17,000
Site Maintenance		
Building, Misc.	$ 2,000	$ 3,000
Roads	5,000	5,000
Subtotal	$ 7,000	$ 8,000
Equipment		
Mech. Arm	$ 6,000	$ 8,000
Dozer	23,000	36,000
Subtotal	$ 29,000	$ 44,000
TOTAL FACILITY ANNUAL COSTS	$114,000	$181,000

TABLE 11

PUSH PIT - LOOSE HAUL

OPTION V

ANNUAL SYSTEM COST SUMMARY

ITEM	CITY OF HELENA	HELENA & S.G.
Amort. of Cap. 20 Yrs	$ 63,000	$106,000
Amort. of Cap. 5 Yrs	40,000	40,000
Transfer Station O&M	114,000	181,000
Transfer to Landfill	54,000	72,000
TOTAL ANNUAL COST	$271,000	$399,000
COST PER TON	$9.00	$9.98
TOTAL CAPITAL COST	$870,000	$1,133,000

dozer in the push pit compared to the cost to operate the front loader on a tipping floor.

PART FOUR

RECOMMENDED FACILITY

PART FOUR

RECOMMENDED FACILITY

A. SELECTION OF RECOMMENDED FACILITY

Upon completion of the analysis for the various options, the consultant held a meeting with the project review committee. The purpose of the meeting was to review the findings of the study and to formulate recommendations concerning the most preferred transfer concept. Based on the information presented by the consultant and the subsequent discussion that was held, the committee formulated the following recommendations:

1) The recommended transfer station should be Option V (the concrete push pit-loose haul facility).

2) The transfer station should be enclosed on three sides with provisions included in the design to install a net or other suitable materials on the open side during the hours that the facility would be closed to deter birds , etc. from being able to access the facility.

3) The facility should be designed to allow individuals to drop off recyclables if they wish in containers to be located at the site.

4) The scale facility should be provided with the proper equipment in order that one scale attendant could operate both scales if the facility were designed to accommodate both the City of Helena and Scratchgravel District.

5) The consultant should re-evaluate the practicability of locating the transfer station at the existing City landfill site.

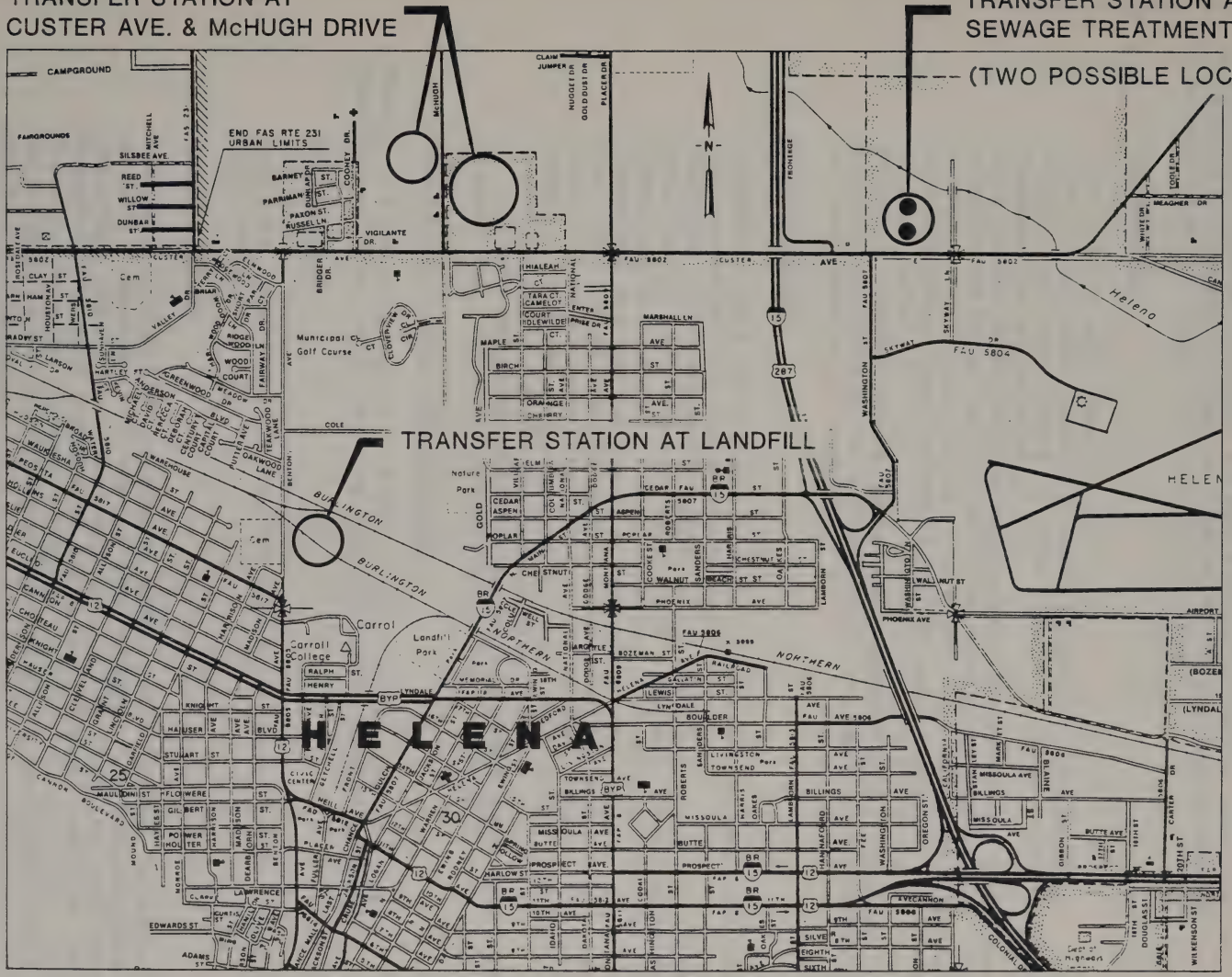
B. PRELIMINARY ANALYSIS OF SITE SELECTION

Although the major emphasis of this study was to evaluate and make recommendations concerning the appropriate type of transfer station to construct, the City officials and the consultant also conducted a brief analysis of four potential sites for the facility. The location of these sites are depicted on Figure 8. Included below is a brief summary of the major advantages and disadvantages of each site.

1. Existing Landfill Site

General Location

Since the majority of the existing landfill site has been filled with wastes, the areas in which a transfer station could be located are quite limited. The only potential location for the



CITY OF HELENA TRANSFER STATION
LOCATION OPTIONS

Figure 8

station would be adjacent to Elk River Concrete's property in the extreme northwest corner of the site. The existing access road to the landfill would continue to be used.

Advantages

- Site is already owned by the City.
- Site is already used for waste disposal. Consequently the siting and permitting process should proceed more quickly compared to other sites.
- Area roads would not be appreciably impacted by additional traffic (average daily traffic on Benton Avenue varies from 8,000 near Carroll College to 5,300 near the golf course. Scratchgravel haulers would add an additional 621 vehicles on peak days).
- Existing City's Solid Waste Department shop is located on site which would be advantageous for scheduling of employees and maintenance of equipment.

Disadvantages

- Easements must be renewed from Carroll College and Rail Link for access to the transfer station.
- Portions of the access roads would have to pass over waste areas which will require additional periodic maintenance.
- A methane gas venting and monitoring system will have to be installed due to the close proximity of the buried waste.
- The site would require significant fill to provide the required grade separation of the structure. The fill most likely will have to be hauled from off site since the majority of the site is filled with refuse.
- To provide sewer service to the site a 2,000 foot main extension and railroad crossing would be required.

2. Gravel Tailings - McHugh Lane

There are several tailing areas located both east and west of McHugh Lane that could be used for siting the transfer station.

Advantages

- Tailings provide good grade separation which would reduce fill costs.

Disadvantages

- Additional traffic on McHugh Lane could cause potential adverse impacts and require improvement to McHugh Lane. (Existing traffic is approximately 1,700 vehicles per day compared to peak traffic of in excess of 800 vehicles per day for transfer station's use.)
- Existing land use designation (residential) would have to be revised and approved.
- May receive opposition from area residents during siting and licensing process.

3. Wastewater Plant Sludge Ponds

This potential site is located in the area that originally was designed to store sewage sludge. This area is no longer used for this purpose. Entrance to the site would be on Custer Avenue.

Advantages

- Existing site is owned by the City.
- The land use in the immediate area is conducive to commercial and industrial development.
- Existing facilities at the wastewater plant would be beneficial for performing maintenance, etc.
- Access from Custer Avenue would not cause significant traffic increases compared to existing traffic (existing daily traffic is 6,500).

Disadvantages

- FAA has indicated that the close proximity of this site to the airport could cause delays and/or problems in the licensing process.
- Area residents have indicated dissatisfaction in locating the facility at this site which could also delay the licensing process.
- The additional traffic on Custer Avenue will require the construction of turning bays near the entrance.

4. Site North of Wastewater Plant

This site is located north of the wastewater plant and east of the City's demolition debris site. Access to the site most likely would be on the frontage road that parallels I-15.

Advantages

- The site is owned by the City.
- The site is adjacent to an existing waste disposal area and thus public objection may be minimized.
- The land use in the immediate area is conducive to commercial and industrial development.
- Additional traffic on the frontage road would not cause significant traffic increases compared to the existing number of vehicles (10,000 per day) that use the road.
- Fill to provide the necessary grade separation for the structure would be available on-site.

Disadvantage

- The FAA is likely to voice similar concerns as described for the sludge pond site.
- The additional traffic using the intersection at the Frontage Road and Custer Avenue may require significant improvements in order to provide an efficient access situation.

Recommendations Of Preliminary Site Selection

Upon review of the draft report, the Study Committee met to formulate their final recommendations. Based on the data presented, the committee unanimously selected the existing landfill site as the preferred site. The committee also recommended that the City and County officials strongly consider the implementation of a vehicle covering ordinance to eliminate the potential of waste haulers accidentally littering the streets and highways when traveling to the transfer or disposal site.

C. COST ESTIMATE OF SELECTED FACILITY

As indicated in Section A of this Chapter, the recommendations of the study committee were to implement the Push Pit-Loose Haul option. Through subsequent discussions with the City officials, it was requested that the consultant include in this final report an updated capital and annual cost estimate to reflect the recommendations formulated by the committee. These recommendations are summarized in Section A of this Chapter. Based on these recommendations and the subsequent conversations with the City officials, the cost estimates were updated to reflect the following:

1) utilize a push pit-loose haul facility,

2) facility would be enclosed on three sides with netting to be placed on the fourth side,

3) facility would be located at the existing City landfill,

4) containers would be located for dropping off recyclables at the station, and

5) the scale system would be designed to allow a one man operation for either 1 or 2 scales.

The updated capital costs are depicted on Table 12. The costs were developed for only the City of Helena waste being handled as well as a larger facility capable of handling the Scratchgravel District's waste. A preliminary layout of the site at the existing landfill is depicted on Figure 9. As indicated on the table the estimated capital costs are broken down into 20 year, 7 year and 5 year components. This is due to the fact that it is anticipated that a 20 year bond would be issued for the facility costs whereas the miscellaneous equipment would be financed over a 7 year period if only the City of Helena's waste were handled and 5 years if both the City's and Scratchgravel's wastes were handled. It is estimated that at 7 and 5 year periods, respectively, it would be time to trade the equipment for new equipment. As indicated on Table 12, the total capital cost for the scenarios would vary from $1,044,000 to $1,318,000 of which $273,000 would be allocated for the equipment.

The costs to operate the transfer station were estimated to vary from $123,000 to $170,000 depending upon whether the Scratch-

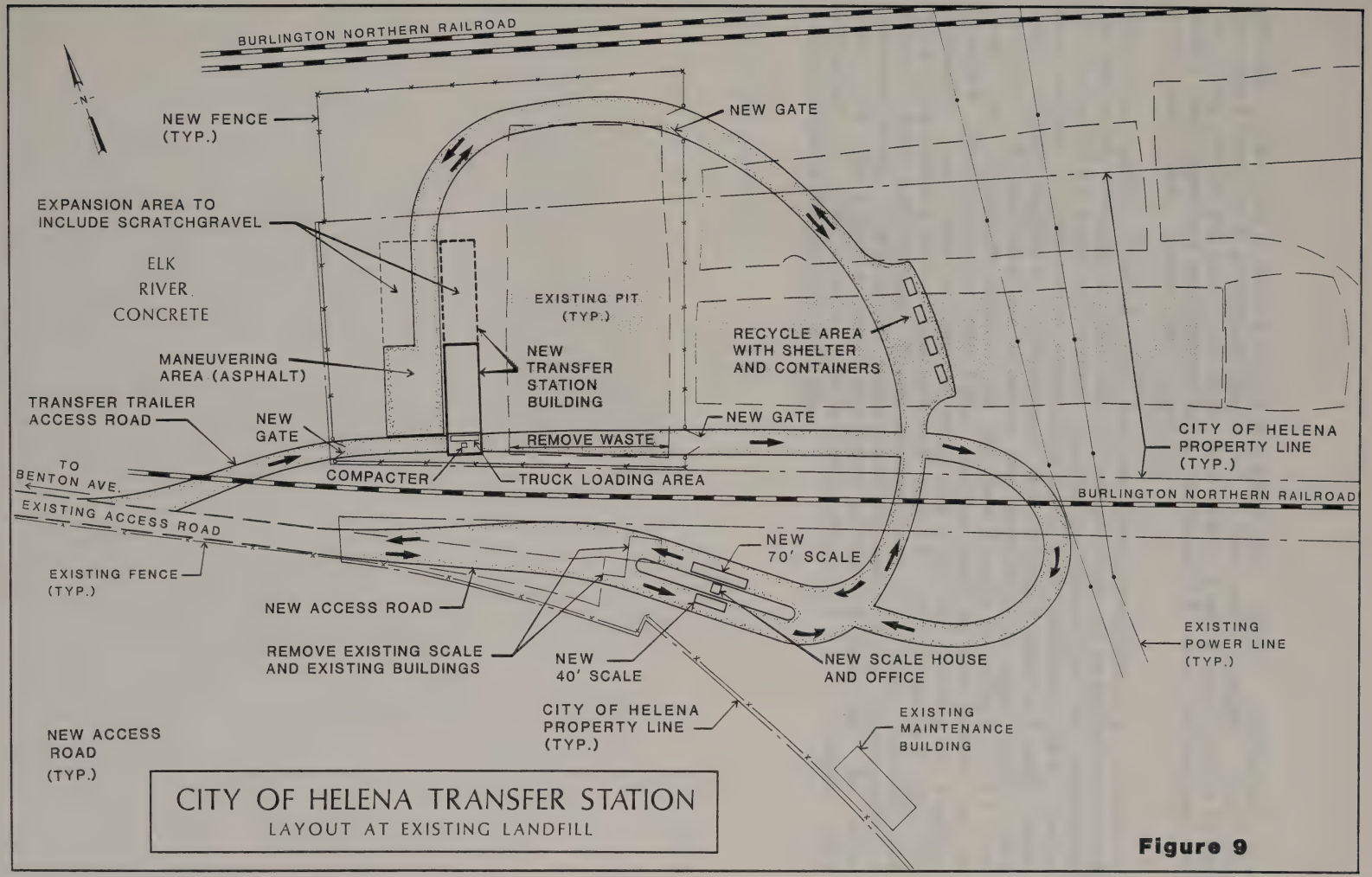
TABLE 12

CAPITAL COSTS

RECOMMENDED OPTION
PUSH PIT-LOOSE HAUL

ITEM	CITY OF HELENA ONLY	CITY OF HELENA SCRATCHGRAVEL
20 Year Components		
1. General Site Work	20,000	20,000
2. Excavation of Waste & Replacement of Fill	30,000	30,000
3. Road and Building Fill	70,000	110,000
4. Gravel	10,000	13,000
5. Paving	21,000	36,000
6. R.R. Crossings(3)	10,000	10,000
7. Methane Gas System	14,000	21,000
8. Building & Concrete (includes shelter for recyclying area)	244,000	367,000
9. Utilities	30,000	30,000
10. Mechanical Arm	70,000	70,000
11. Office & Scale House	15,000	15,000
12. Scale(s) & Equipment	65,000	100,000
13. Hopper	25,000	25,000
14. Fencing & Gates	7,000	7,000
15. Contingency & Engineering (20%)	126,000	171,000
16. Construction Interest	14,000	20,000
Subtotal	$771,000	$1,045,000

	7 YEAR COMPONENTS	5 YEAR COMPONENTS
1 New Tractor	55,000	55,000
2 New Trailers	90,000	90,000
Containers for Recycling	5,000	5,000
1 Dozer	110,000	110,000
Contingency (5%)	13,000	13,000
Subtotal	$273,000	$273,000
TOTAL	$1,044,000	$1,318,000



CITY OF HELENA TRANSFER STATION

LAYOUT AT EXISTING LANDFILL

Figure 9

DAMSCHEN AND ASSCOIATES

gravel District's waste would be handled. These estimates are depicted on the attached Table 13. The costs assume that the facility would be open six days per week if only the City's waste would be handled and seven days per week if the Scratchgravel Districts' waste were also handled.

The total annual system cost for the two scenarios are presented in Table 14. These system costs include the 20 year amortization of the capital facility costs, the amortization of the equipment over either 7 or 5 years depending upon the scenario, the operation of the transfer station and the labor, operation and maintenance of the transfer tractor and trailers to haul the waste from the transfer station to the new County landfill. As indicated in the table, the total system cost is estimated to be $304,000 per year to handle only the City of Helena's wastes. This represents a cost per ton of $10.13. As indicated in the table, the additional total system cost to also handle the Scratchgravel District's waste is $107,000. This represents a cost for the Scratchgravel District of $10.70 per ton. As also indicted in the table, the average cost if all wastes were handled would be $10.28 per ton.

TABLE 13

ANNUAL OPERATING COSTS

RECOMMENDED OPTION
PUSH PIT-LOOSE HAUL

	CITY OF HELENA ONLY (Six Days/Wk)	CITY OF HELENA & SCRATCHGRAVEL (Seven Days/Wk)
Labor		
1/2 Supervisor	14,000	$ 14,000
Operators ($10.50/Hr)	30,000	35,000
Laborers ($7.00/Hr)	8,000	29,000
Scale Attendant ($7.00/Hr)	20,000	24,000
Subtotal	$72,000	$102,000
Utilities & Insurance		
Other	$ 5,000	$ 7,000
Insurance	5,000	10,000
Subtotal	$10,000	$ 17,000
Site Maintenance		
Building, Misc.	$ 2,000	$ 3,000
Roads	5,000	5,000
Subtotal	$ 7,000	$ 8,000
Equipment		
Mech. Arm	$ 6,000	$ 8,000
Dozer Operation & Maintenance	28,000	55,000
Subtotal	$34,000	$ 63,000
TOTAL FACILITY ANNUAL COSTS	$123,000	$170,000

TABLE 14

ANNUAL SYSTEM COST

RECOMMENDED OPTION
PUSH PIT-LOOSE HAUL

ITEM	CITY OF HELENA ONLY	ADD COST FOR SCRATCHGRAVEL	CITY & SCRATCHGRAVEL
Amort. of 20 yr. Cap (8%)	$79,000	$28,000	$107,000
Amort. of 7 or 5 yr. Cap (10%)	56,000	16,000	72,000
Transfer Station O&M	123,000	47,000	170,000
Transfer Vehicle, Labor, Oper. & Maint.[1]	46,000	16,000	62,000
TOTAL ANNUAL COST	$304,000	$107,000	$411,000
TOTAL TONS PER YEAR	30,000	10,000	40,000
COST PER TON	$10.13	$10.70	$10.28

(1) Based on $0.14 per ton-mile and 11 mile haul distance to new landfill site.

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